The Fichepain Hypothesis: A Fluid Interpretation of Gravitation

1. Introduction

The unification of General Relativity and Quantum Mechanics remains one of the greatest challenges in contemporary physics. The Fichepain hypothesis proposes an alternative approach: space is not a geometrically deformable entity, but a rigid framework filled with a fundamental medium described as a "photonic soup," whose density varies in the presence of mass. In this perspective, gravitation does not arise from spacetime curvature, but from a density gradient within this medium.

2. General Principle

2.1 Local Densification of the Medium

A massive body locally modifies the density of the surrounding photonic medium. Gravitational attraction is interpreted as the mechanical effect of this density variation.

2.2 From Geometry to Fluid Mechanics

The geometric description of gravitation is replaced by an approach analogous to fluid mechanics, where dynamics result from local variations of pressure or density.

3. Junction Equation

3.1 Mathematical Formulation

The central relation of the model connects local density to the gravitational potential:

$$\mathcal{F}\rho = \frac{GM}{r^2c^2}$$

where $\mathcal{F}$ is the junction constant, ρ the local density of the photonic medium, G the gravitational constant, M the mass considered, r the distance from the center of mass, and c the speed of light.

3.2 Physical Interpretation

This equation establishes a direct link between a macroscopic quantity (mass) and a microscopic property of the medium. It represents the conceptual bridge between astronomical scales and fundamental structure.

4. Refractive Index of the Vacuum

4.1 Expression of the Index

Within this framework, light propagates through a medium whose refractive index depends on density:

$$n(r) = 1 + \frac{GM}{r^2 c^2}$$

4.2 Optical Consequence

Light deflection becomes a progressive refraction phenomenon, analogous to propagation in a material medium with spatially varying refractive index.

5. Ray Dynamics

5.1 Fundamental Equation

Light trajectories are determined by the geometric optics equation in an inhomogeneous medium:

$$\frac{d}{ds}\left(n\frac{d\vec{r}}{ds}\right) = \nabla n$$

5.2 Expanded Form

Expanding this expression yields:

$$\frac{d^2\vec{r}}{ds^2} = \frac{1}{n}[\nabla n - (\nabla n \cdot \vec{v})\vec{v}]$$

with $\vec{v} = \frac{d\vec{r}}{ds}$. This formulation ensures dynamical consistency of light propagation.

5.3 Gradient of the Index

The radial gradient associated with the index is:

$$\frac{dn}{dr} = -\frac{2GM}{r^3 c^2}, \qquad \nabla n = \frac{dn}{dr}\frac{\vec{r}}{r}$$

6. Experimental Test: Solar Light Deflection

6.1 Relativistic Reference Prediction

General Relativity predicts for light deflection near the Sun:

$$\alpha_{GR} = \frac{4GM}{bc^2} \approx 1.75 \text{ arcsec}$$

where b is the impact parameter.

6.2 Numerical Simulation

The ray equation can be numerically integrated to measure the angle predicted by the fluid model:

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```python
import numpy as np
from scipy.integrate import solve_ivp

G = 6.67430e-11
c = 299792458
M = 1.989e30
R_sun = 6.9634e8

def n(r):
    return 1 + (G * M) / (r**2 * c**2)

def grad_n(x, y):
    r = np.sqrt(x**2 + y**2)
    dn_dr = -2 * G * M / (r**3 * c**2)
    return dn_dr * x/r, dn_dr * y/r

def equations(s, Y):
    x, y, vx, vy = Y
    r = np.sqrt(x**2 + y**2)
    nx = n(r)
    gx, gy = grad_n(x, y)
    v = np.array([vx, vy])
    g = np.array([gx, gy])
    accel = (g - np.dot(g, v) * v) / nx
    return [vx, vy, accel[0], accel[1]]

b = 1.1 * R_sun
x0 = -20 * R_sun
y0 = b
v0 = np.array([1.0, 0.0])
v0 = v0 / np.linalg.norm(v0)
Y0 = [x0, y0, v0[0], v0[1]]

sol = solve_ivp(equations, [0, 40 * R_sun], Y0, rtol=1e-9, atol=1e-12)

vx_final = sol.y[2, -1]
vy_final = sol.y[3, -1]
angle = np.arctan2(vy_final, vx_final)
angle_arcsec = angle * (180/np.pi) * 3600

print("Predicted deflection (arcsec):", angle_arcsec)
print("Observed GR value ≈ 1.75 arcsec")
```

7. Scientific Discussion

7.1 Confrontation with Observations

The numerical test allows direct comparison between the model's prediction and experimental observation. Any systematic discrepancy, particularly regarding the factor 4 characteristic of General Relativity, becomes a central point of analysis.

7.2 Conceptual Scope

The Fichepain hypothesis proposes a mechanical and optical reinterpretation of gravitational phenomena. Its validity depends entirely on its ability to quantitatively reproduce established experimental results while offering an alternative conceptual framework.